Claims

1. An alkaline process for the production of a pulp from lignocellulosic material and the recovery of pulping chemicals used in said process comprising the steps of:

a) providing a feed stream of finely divided lignocellulosic material,

b) contacting lignocellulosic material in a digester with an alkaline aqueous buffer solution comprising at least on of a sodium or potassium compound and a boron compound, during a period of time and at a temperature sufficient to obtain a stream of substantially delignified lignocellulosic material,

c) further treating said substantially delignified lignocellulosic material to obtain a pulp product,

d) extracting spent liquor comprising dissolved lignin components and spent chemical substances from step b),

e) partly or fully oxidizing spent liquor originating from step d) in a recovery boiler or gas generator providing one gaseous stream comprising carbon dioxide and one solid or liquid ash stream comprising at least one of a sodium or potassium compound and a boron compound.

wherein

i) a boron compound in the alkaline buffer solution in step b) is a metaborate or tetrahydroxy metaborate ion, $B(OH)_4^-$, originating from the dissolution of alkali borates in an aqueous liquid, said metaborate and metaborate ion being present in an amount providing a sodium plus potassium to boron ((Na + K)/B) molar ratio in the alkaline buffer solution in the range from about 1:1 to about 10:1.

ii) the solid or liquid ash stream comprising sodium or potassium compounds and boron compounds provided in step e) is dissolved in an aqueous solution to provide an alkaline buffer solution comprising metaborate and carbonate ions, whereof at least a portion is transferred to step b) or c) without prior subjection to treatment with lime or calcium compounds for the generation of hydroxide ions.

iii) the solid or liquid ash stream in e) comprises alkali metaborate and alkali carbonate, which substances, or corresponding ions after dissolution of the solid or liquid ash stream in an aqueous solution, are present in a combined concentration which is higher than the combined concentration of other dissolved compounds originating from dissolution of said solid or liquid ash stream in the aqueous solution.

2. A process according to claim 1 wherein the finely divided lignocellulosic material provided in step a) is subjected to a pre-treatment before contact with the alkaline buffer solution in step b)

3. A process according to claim 2 wherein the pre-treatment includes a mild prehydrolysis step wherein the lignocellulosic is submerged in a hot aqueous solution or heat treated by the action of steam or both.

4. A process according to any one of the preceding claims wherein a delignification catalyst is added to be present in step b) of claim 1.

5. A process according to claim 3 and 4 wherein a delignification catalyst is added to the lignocellulosic material and present during the mild prehydrolysis step.

6. A process according to claim 1, wherein the concentration of sulphides in an aqueous alkaline buffer solution is lower than about 5 grams/litre.

7. A process according to claim 1, wherein further treating said substantially delignified lignocellulosic material to obtain a pulp product in c) comprises at least one of an alkaline oxygen delignification or an alkaline bleaching stage.

8. A process according to claim 7, wherein at least a major portion of alkaline buffer solution used in an oxygen delignification or bleaching stage is recycled from a chemicals recovery system without prior subjection to treatment with lime or calcium compounds for the generation of hydroxide

9. A process according to claim 1, wherein at least a major portion of the alkaline buffer solution used in step b) is recycled from a chemicals recovery system without prior subjection to treatment with lime or calcium compounds for the generation of hydroxide.

10. Process according to any one of the preceding claims, wherein a chemicals recovery system for recovery and preparation of alkaline buffer solution used in step b) does not include a limekiln or causticizing plant for regeneration of pulping chemicals.

11. Process according to any one of the preceding claims, wherein said delignification catalyst is selected from aromatic organic compounds, preferably anthraquinone or a derivative of anthraquinone and added in a quantity ranging from 0.05 % to 0.5 % on dry lignocellulosic material.

12. Process according to any of the preceding claims wherein said delignification catalyst is a sulphide.

13. Process according to claim 1 wherein a boron compound in the alkaline buffer solution in step b) is present in an amount providing a sodium plus potassium to boron ((Na + K)/B) molar ratio in the alkaline buffer solution in the range of from about 1.5 to about 5, and yet more preferably in a range from about 1.5 to 4.
